

BIOLOGY OF MALABAR BANDED SWALLOWTAIL *PAPILIO LIOMEDON* MOORE¹C. SUSANTH²¹Accepted August, 2003²Prakriti, Indira Nagar, Peroorkada P.O., Thiruvananthapuram 695 005, Kerala, India.

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The biology of the Malabar Banded Swallowtail *Papilio liomedon* Moore on a new larval food plant was recorded and the larval food plant investigated. The life cycle, brood size, larval instar duration, pupae and sex ratio were observed.

Keywords: Life cycle, new host plant, Malabar Banded Swallowtail, *Papilio liomedon* Moore, endemic butterfly, Western Ghats

INTRODUCTION

The Malabar Banded Swallowtail *Papilio liomedon* Moore, a large, brownish-black butterfly, with a prominent cream yellow band on its wing, is among the rarest of papilionid butterflies of southern India. It is endemic to the Western Ghats and an inhabitant of semi-evergreen and evergreen forests. It normally flies high in the dense forest, but is attracted to clearings and roadsides, where its adult-food plants, *Clerodendron paniculatum*, *C. infortunatum* and *Stachytrapheta indica* grow. It is not unusual to find specimens flying even in heavy rain. Over forest paths, particularly during monsoon, this powerful flier is seen flying fast with rapid wing beats. It is easier to approach while mud puddling.

Achroynychia laurifolia Blume (Family Rutaceae) is the recorded larval food plant of the Malabar Banded Swallowtail. *Achroynychia laurifolia* is not a widely distributed species and is seen in semi-evergreen and evergreen forests. The new food plant reported in this paper, Indian Aspen *Evodia roxburghiana* also belongs to Family Rutaceae. This tree occurs in deciduous, semi-evergreen and evergreen forests all over India. *Evodia roxburghiana* is also seen at an elevation of 1,886 m in the Agasthyakoodam peak, Neyyar Wildlife Sanctuary, Thiruvananthapuram.

STUDY AREA AND METHODOLOGY

The study was carried out in the Arippa Ammayambalam pacha, lying within 77° 1' 45" - 77° 2' 50" E and 8° 49' - 8° 35' N, lowland evergreen forests of the Western Ghats, in Kulathupuzha reserve forests, 52 km from Thiruvananthapuram.

Observations on the biology of the Malabar Banded Swallowtail *Papilio liomedon* Moore have been made since 1996 under semi natural conditions. Eggs collected from the tender shoots of *Evodia roxburghiana* were transferred to cylindrical glass jars, 22 cm tall and 10 cm wide, with a capacity

of 2 litres, partially immersed in a tray of water kept in a cool place. Number of eggs/brood, hatching period, duration of larval instars, mode of larval feeding, pupation and metamorphosis were noted. Sex ratio after emergence, natural predators, number of unhatched eggs, number of diseased larvae, and other factors were noted. Number of eggs/brood, hatching rate, pupation rate, and metamorphosis rate were also observed under natural conditions. Using this data, the life cycle (Table 1) of the Malabar Banded Swallowtail *Papilio liomedon* Moore was worked out.

RESULTS AND DISCUSSION

Egg

The female lays about 16 eggs one over the other like a stick on tender shoots of *Evodia roxburghiana* (Fig. 1A). No visible change was observed in the eggs for three days. The orange eggs gradually faded to yellow. Pale black markings appeared on the upper side of the egg shell on the fourth day. On closer observation through a magnifying glass, the black spots were identified as the heads of the larvae.

1st Instar

On the fifth day, the larvae emerged from the eggs. The outermost egg hatched first and the egg nearest the tender shoot hatched last. After eating the eggshells, the larvae congregated at the bottom of the leaf. The newly hatched 3 mm long larva was orange with a black head. The body was covered with tiny hairs. On the second day after emergence, the larvae began to feed on tender leaves. They ate the edges of the leaves and made small circles on tender leaves. Each grew to about 6 mm. The hair covering the body disappeared by the third day. The larvae now produced tiny silken threads by which they hung on leaves. The larvae congregated on the upper side of the leaves. Each one grew 7 mm long. On the fifth day the larvae seemed less active. When alarmed due to any movement in the leaves, the larvae raised their heads and

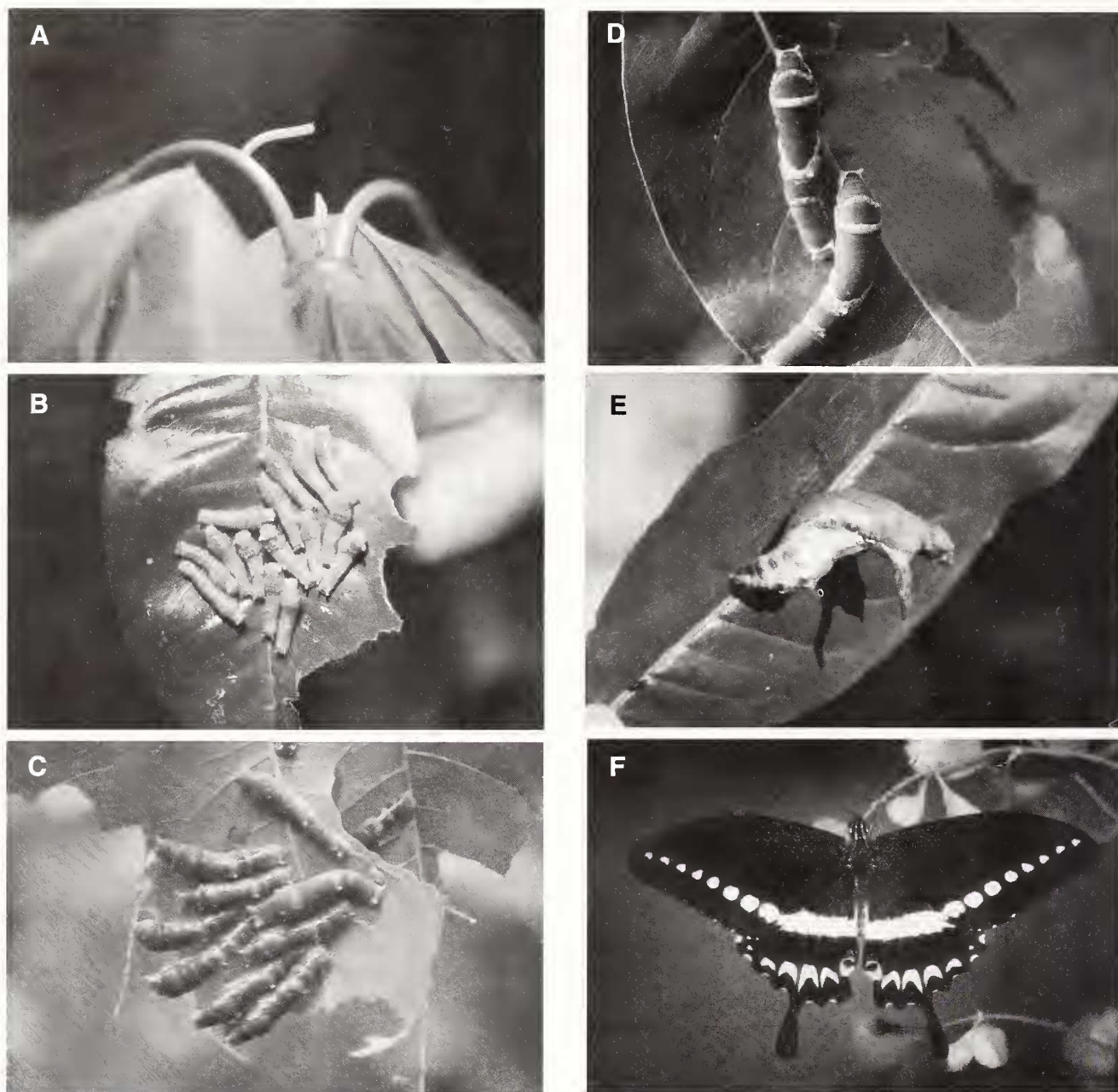


Fig. 1: Malabar Banded Swallowtail *Papilio liomedon*, A. Egg chain on *Evodia roxburghiana*; B. Larval congregation-Instar II; C. Larval congregation-Instar IV; D. Green and Blue colouration of IVth Instar Larvae; E. Pupa in Green colour; F. Female Butterfly (dorsal)

moved sideways, and were able to produce a faint knocking sound by wriggling movements of body.

2nd Instar

The larvae began to shed their old skin. The outer black covering of the head was also shed. The head was now pale orange, and the larvae 9 mm long. On the seventh day, the larvae became dark orange. After voracious feeding they congregated at the middle of the upper leaf surface (Fig. 1B). Four pairs of prominent spines were seen on segment 2, 7, 12

and 13. On the eighth day, the larvae were 14 mm long.

3rd Instar

The second moulting occurred on the ninth day. Larvae congregated over the leaf surface. They ate voraciously. When alarmed, the larva exerted its pale yellow osmeterium, giving a pungent smell.

On 11th day, the activities of the larvae became sluggish; they rested through most of the day on the underside of the leaves. A cream border was observed on the

Table 1: Life cycle of Malabar Banded Swallowtail *Papilio Iomedon* Moore

Stages	No. of broods		No. of eggs	Hatching period/ Instar moulting/ Pupation in days	No. of Larva Emerged	No. of Larva Pupated	No. of Adults Emerged & the sex	Mortality of Insects due to Parasites/ Pathogens/ Predators	Survival Rate		Remarks
	Natural	Semi Natural							Natural Broods	Semi Natural broods	
Egg	1	—	8	4 days	5	1	1-F	7	13%	—	3 eggs were not hatched 4 larvae emerged were eaten by snails
	2	—	5	4 days	0	0	0	5	0%	—	Eggs were eaten by snails
	3	—	10	4 days	10	2	2-F	8	20%	—	8 larvae eaten by snail and praying mantis
	4	—	5	4 days	0	0	0	5	0%	—	Eggs were eaten by snails
	—	1	6	4 days	6	5	4 3-M 1-F	2	—	67%	Males outnumbered females
	—	2	14	4 days	14	7	7	7	—	50%	Females outnumbered males
	—	3	16	4 days	14	14	14 6-M 8-F	2	—	87%	Females outnumbered males
	—	4	9	4 days	8	8	8 3-M 5-F	1	—	89%	Females outnumbered males
Larva	—	—	—	5 days	—	—	—	—	—	—	—
Ist Instar	—	—	—	3 days	—	—	—	—	—	—	—
IInd Instar	—	—	—	4 days	—	—	—	—	—	—	—
IIIrd Instar	—	—	—	4 days	—	—	—	—	—	—	—
IVth Instar	—	—	—	3 days	—	—	—	—	—	—	—
Vth Instar	—	—	—	3 days	—	—	—	—	—	—	—
VIth Instar	—	—	—	15 days	—	—	—	—	—	—	—
Pupa	—	—	—	30-40 days (variable)	—	—	—	—	—	—	—
Adult	—	—	—	—	—	—	—	—	—	—	—

Occured in two colours.
Dead leaf colour and green colour
Male butterfly is more aggressive than the female butterfly

lower side of the body. The larvae were 22 mm long.

4th Instar

The third moulting occurred on the 13th day. The colour faded gradually till it became semi-translucent, pale orange blended with olive green (Fig. 1C, 1D). The cream border was more predominant on lower side of the body. The pair of spines on segment 12 disappeared. The tubercle on segment 7 was predominant. Most of the time the larvae rested on the leaves or branches of the food plant. The larvae were 30 mm long.

5th Instar

The fifth instar emerged on the 17th day. The colour of the larvae changed completely; it was now overall dark velvety green. The head was yellowish-orange with a red osmeterium. The body had golden yellow sides and golden crests on segments 4 and 5. It was swollen at segments 3 and 4, with lateral black eye spots. A black band was seen just behind the crest on segment 5. The 3 pairs of spines on segment 2, 7 and 13 were golden yellow. A yellow and reddish-brown blotched broad band was observed on segments 7 and 8. The bands on 7 and 8 together formed a 'V' on the dorsum of the larva. A reddish-brown blotched band was also observed on segments 9 and 10 (posterior segments). The larvae were now 38 mm long. They fed on old leaves and seemed to avoid tender leaves.

By the 19th day, they were 45 mm long. The larvae were a glistening velvet green, which appeared smoky blue when observed in direct sunlight. The larvae were less active and aggregated on the underside of leaves for their final moulting.

6th Instar

The fifth moulting occurred on the 20th day. The larvae were 50 mm long. After moulting, the larvae ate voraciously. They began to bite the leaves into small pieces and ate them. The small pieces of leaves were suspended on the thread produced by the larvae. They showed their brilliant red osmeterium when alerted. A pungent smell was also produced. They were also seen feeding at night. The larvae rested on self woven threads as on a bed at night. The larvae continued to feed till the 22nd day. They were 56 mm long before pupation.

Pupation

The lower portion of the pupal case was yellow or fluorescent green with purple lines. Between the head and thorax region, a projection similar to the handle of a jug was observed. This projection, which is about 6 mm long, is the

distinguishing feature of the chrysalis of *Papilio liomedon* Moore. Just below the thoracic region, two yellow eye marks were apparent. Two black spots on the yellow rings resembled the eyes. Two black spots were also seen at the end of abdomen. The pupa was 30 mm long and 14 mm thick at the middle portion. The pupation period extended for 15 days (Fig. 1E).

Emergence of adult butterfly

On the morning of the 15th day of the pupal period, the pupal case became transparent. The creamy spots of the forewing were also visible. The butterflies emerged in the late morning and afternoon. The wingspan of the male butterfly was 90-100 mm. The male was dark brownish-black with a greenish, glistening creamy yellow band. On each hindwing near the tornal angle, there was a black spot partially encircled by a pale orange ring. Towards the base, a small spot of glistening violet was observed in each wing. The wingspan of the female was 100-110 mm. The female was dull brownish-black with a pale creamy yellow band. Bright orange colour at the tornal angle is the diagnostic feature of the female (Fig. 1F). The male butterfly was more aggressive than the female. In 20 minutes, the fluid had dried, the wings stretched to full span, and the butterfly actively fanned its wings, ready for flight.

Wynter Blyth (1957) has stated, "There seem to be two or three broods in the year, and in breeding the males largely outnumbered the females." But according to my observations, the females outnumber males in three out of four broods (Table 1). Tailbot (1939) reported that the female lays ten eggs on tender leaves of *Acronychia laurifolia* Blume. On October 7, 1998, I observed a female laying 16 eggs on a tender shoot of *Evodia roxburghiana*, which has not been recorded earlier as a host plant of this butterfly.

In natural surroundings, the survival rate of *Papilio liomedon* Moore is less than 10% (Table 1). In simulated natural conditions in the lab, the survival rate is 70%. In natural surroundings snails were important predators, which ate most of the eggs laid by the female. Snails roam through the host plants in search of eggs and early instar larvae. During monsoon, the undergrowth of evergreen forests is heavily infested with snails. Other predators including spiders, praying mantis, black ants and parasitic wasps have also been observed. Degradation of evergreen forests through extensive human interference in recent years is another challenge to the existence of the species. The cutting and clearing of undergrowth, especially the food plants of this rare papilionid, causes depletion of its population in evergreen forests.

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